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NATIONAL PHOTOGRAPHIC
INTERPRETATION CENTER

TECHNICAL
PUBLICATION

TEST AND EVALUATION REPORT

EYEPIECE LOCKING DEVICES FOR [redacted] 240R PODS

25X1

DECLASS REVIEW BY NIMA / DoD

CONFIDENTIAL

NPIC/R-23/72
JULY 1972

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25X1 [redacted] 240 R PODS

JULY 1972

Test and Evaluation Branch
Engineering Support Division
Technical Services Group
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ABSTRACT

Three devices to lock eyepiece image rotation and interpupillary distance on the [redacted] Zoom 240R Pod have been tested. Two were add-on items manufactured by [redacted] The third was a built-in device fabricated by [redacted]

The comparative tests showed that the [redacted] device was more positive, simpler to use, and will not degrade the operation or interfere with the maintenance of the pod in any way.

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1. INTRODUCTION

1.1 The use of the Zoom 240R has led to the observation that inadvertent change of the eyepiece image rotation (EIR) and interpupillary distance (IPD) was occurring with great frequency. Changes in the EIR caused eyestrain since these changes were usually small and could be accommodated by the eye with subsequent discomfort. A slight bump by the bridge of the nose was sufficient to require readjustment of the IPD. Furthermore, it was impossible to focus the eyepiece properly with one hand and maintain a coherent image since movement of the focus ring would cause rotation of the EIR control.

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1.2 [redacted] was asked to provide some means of locking these two movements in the Zoom 240R system. An external, add-on device was given to NPIC in June 1971 and tested (T&E Report NPIC/R-04/72). This device worked but was mechanically rather poor and would not fit both sizes of eyepiece tubes currently in use. [redacted] was then asked to provide locking potential for all Zoom 240R pods.

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1.3 On 23 February, [redacted] delivered a Zoom 240R which had been modified to include built-in EIR and IPD locks (see Figures 1, 2, & 3). This approach was accepted, but the assembly was not complete and mechanical deficiencies were noted. The Test and Evaluation Branch, ESD/TSG, recommended procurement and evaluation of a finished preproduction sample.

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1.4 [redacted] was concurrently given a contract to devise a means of locking the EIR and IPD. An add-on device which provided the necessary locking capability at less cost wan anticipated.

1.5 On 18 April, the production model of the [redacted] 240R with eyepiece locks was delivered to TEB. On 2 May, two [redacted] devices were delivered for testing (see figures 4 & 5).

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2. SUMMARY OF TEST RESULTS

2.1 IPD Lock

25X1 2.1.1 [redacted] uses a threaded rod and knurled wheel to both change the IPD and lock its position. The two devices furnished differ only in the diameter of the wheels used to adjust the IPD. The larger of the wheels is 0.75 inch in diameter and requires 24 ounce-inches of torque to turn. This excessive torque masks the end points of IPD travel. The operator, therefore, cannot feel that he has reached the mechanical limit of travel and may force the mechanism out of adjustment while trying to increase the IPD. The smaller of the wheels is 0.38 inch in diameter and requires less than 1 ounce-inch to adjust. The IPD will not change with a force of 10 pounds on the eyepiece.

25X1 2.1.2 [redacted] device locks tightly at any position (minimum, maximum, or intermediate) after a force of 2 pounds is applied to the locking lever. After application of a 2-pound force on the lever, a force of 10 pounds on the eyepieces will not change the IPD.

2.2 Eyepiece Image Rotation Lock

25X1 2.2.1 [redacted] device does not "lock" the EIR. It does supply frictional drag to inhibit unwanted movement of the eyepieces. It does permit refocusing of the focusable eyepiece without rotating the image. However, the drag provided is not sufficient to prevent unwanted rotation if the actuating "ears" are inadvertently bumped. The force required on any "ear" to achieve rotation is variable from 0.25 to 1.6 pounds, depending on the mechanism tested and its relative position on the eyepiece. Changes in image rotation are one hand, single motion operations. A total 415±5°-image rotation is available at each eyepiece.

25X1 2.2.2 The [redacted] eyepiece image rotation lock does not "lock" the EIR. However, it provides sufficient drag so that inadvertent image rotation is impossible. The unlocking, rotating, locking cycle is not a single-motion operation, but it can easily be done with one hand. Rotational motion of 25° of each locking ring completely locks/unlocks each eyepiece. When unlocked, image rotation is unlimited.

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2.3 General

2.3.1 The devices furnished by [redacted] fit only the smaller diameter eyepiece tubes. Another device could easily be built to fit the larger tubes. 25X1

25X1 2.3.2 The [redacted] modification is adaptable to all pods and image rotation eyepiece tubes. The manufacturer suggests that the work be done at the factory. However, the modification could be done in the field since it involves only minor machining to the pod housing and changing/addition of small, internal parts.

2.4 Operational Evaluation

The three devices were evaluated by IEG, IAS, SPAD, and DIA/DI-8 for approximately 3 days each. In the opinion of these components, the [redacted] approach is superior to the [redacted] 25X1 25X1

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3. CONCLUSIONS AND RECOMMENDATIONS

25X1 3.1 The [redacted] modification is superior to the [redacted] 25X1 add-on device. The IPD lock is quick and simple to use. The EIR locks are positive and will prevent unwanted rotation. The device in no way complicates the normal use of the optics, and will not impede routine maintenance. Additionally, no maintenance or adjustment of the [redacted] device will be 25X1 required.

3.2 Two minor changes to the [redacted] device are recommended. 25X1 First, the IPD locking lever should be redesigned to present a flat surface for application of the locking force instead of the present edge which is uncomfortable for finger action. Second, the position of the set screws which hold the lever on its mount should be changed to make them readily accessible for removal and tightening.

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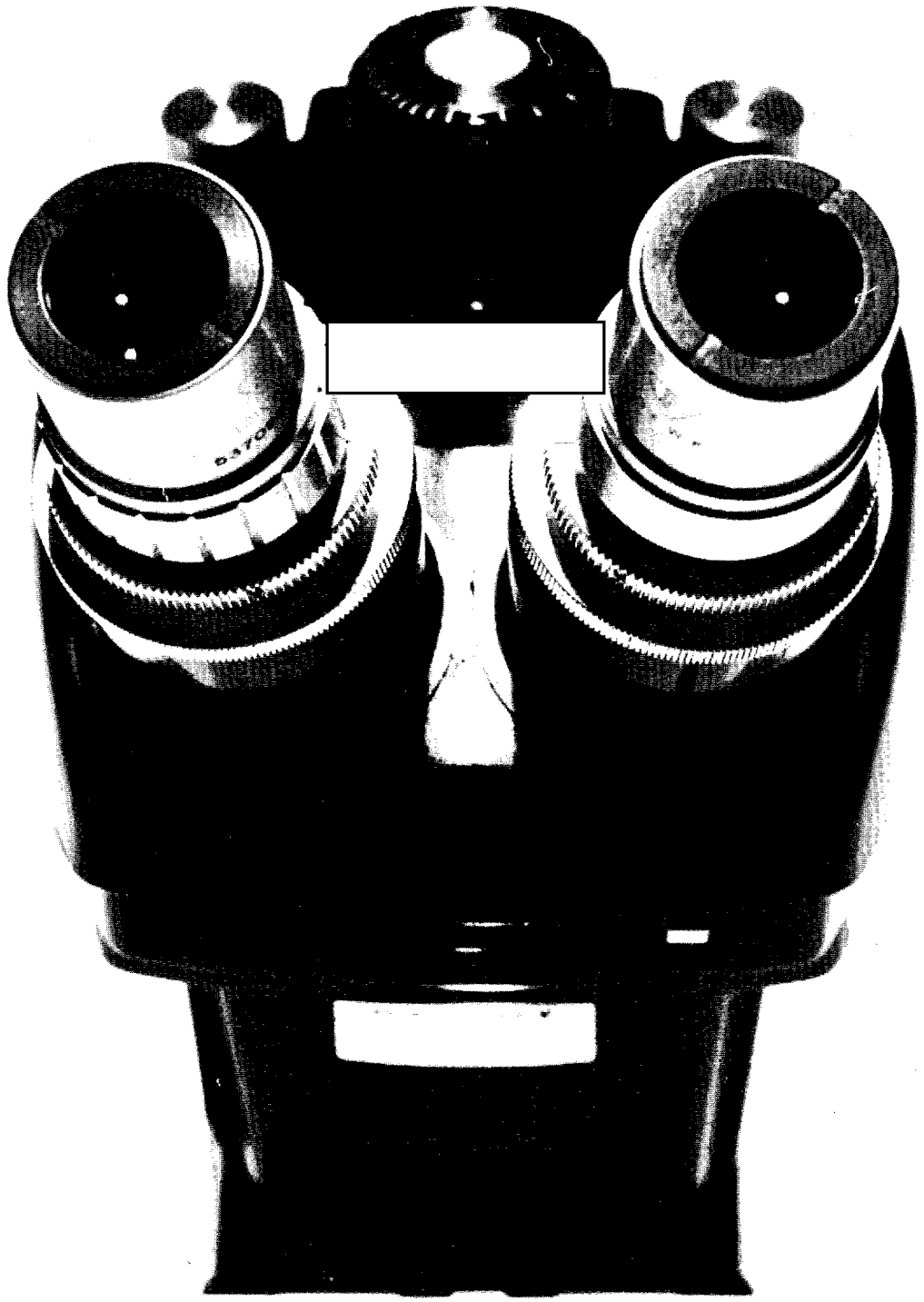

25X1

25X1 Figure 1. [redacted] Zoom 240R with Built-In Interpupillary Distance and Eyepiece Image Rotation Locks.

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Figure 2. Disassembled [redacted] Eyepiece Image Rotation Lock. 25X1

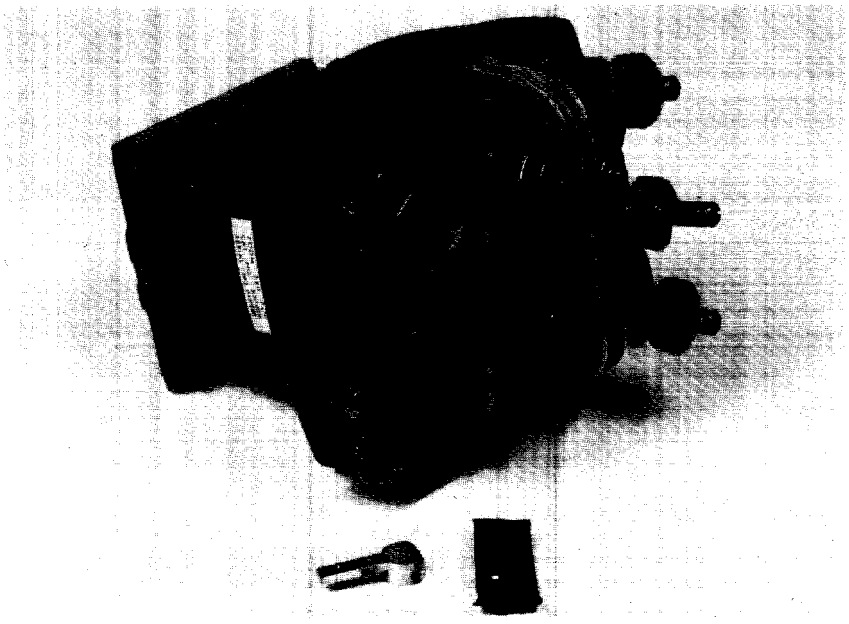

Figure 3. Disassembled Zoom 240R Interpupillary Distance Lock.

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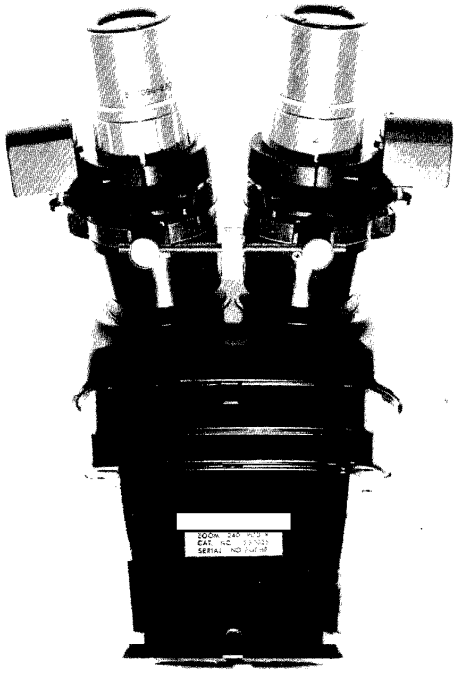

Figure 4. [redacted] 240R with [redacted] Add-On Interpupillary Distance and Eyepiece Rotation Lock Device (0.75 inch knurled wheel).

25X1

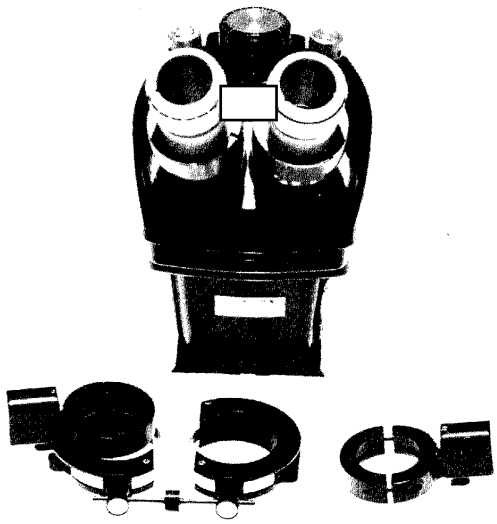

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Figure 5. Disassembled [redacted] Add-On Device (.38 knurled wheel) and [redacted] Zoom 240R Pod.

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